

## **REMARKS**

This is a supplemental amendment filed to provide more complete patent claim coverage. This supplemental amendment is filed in addition to the amendment filed on July 29, 2008, and in further response to the Office Action issued April 4, 2008.

### **I. NEW CLAIMS 81 TO 83**

New independent claim 81 was necessitated by the change to the restrictive “consisting of” wording in claims 38, 40 to 47, 49, and 50.

The change in the wording of claim 42 excludes the alkali oxide and alkaline earth oxides of claims 43 and 44 as well as the additional inorganic oxides of claim 45. Thus none of the claims 38, 40 to 47, 49, and 50 provides patent claim coverage for all possible embodiments of the applicants’ inventive X-ray opaque glass.

New independent claim 81 is also drafted with “consisting of” wording but includes the subject matter of claims 42, 43, 44, and 45. Furthermore the disclosure obviously supports the subject matter of new claim 81, because it contains a combination of the subject matter from the foregoing claims. No new matter has been added.

New dependent claim 82 contains subject matter from claim 49 and also from the disclosures on page 8, line 12, of the applicants' originally filed US specification.

New dependent claim 83 includes subject matter from claim 50.

## **II. THE RELATIONSHIP OF THE NEW CLAIMS TO THE PRIOR ART**

Claims 38 to 48 were rejected as obvious under 35 U.S.C. 103 (a) over the disclosures in US Patent 6,128,430, issued to Chu, et al.

Claims 49 and 50 were rejected as obvious under 35 U.S.C. 103 (a) over the disclosures in US Patent 6,128,430, issued to Chu, et al, in view of Kunert, et al.

The arguments to overcome the obviousness rejection of claims 38 to 48 in the amendment filed on July 29, 2008 are incorporated here by reference and should be reviewed. The argumentation here is primarily intended to show that new claim 81 should not be rejected as obvious based on the disclosures in Chu, et al.

New claim 81 includes the subject matter of claim 42, 43, 44, and 45, but contains the same required oxide ingredients, namely SiO<sub>2</sub>, Yb<sub>2</sub>O<sub>3</sub> and ZrO<sub>2</sub>, in the same concentration ranges as in claims 42 and 38. However the other oxide

ingredients with their concentration ranges that have been included in new claim 81 broaden the scope of claim 81 with respect to the scope of claims 38 and 42.

Particularly, new claim 81 and the previously pending claims 38, 40 to 47, 49, and 50 are limited to the **recited** ingredients because “consisting of” is used as the transitional wording instead of “comprising”. The claimed glass contains **no other** oxide ingredients besides those that are **recited** in the claims.

A case of *prima facie* obviousness would be established by a prior art reference that discloses a glass composition that contains the same ingredients as the glass claimed in e.g. claim 81 with respective concentration ranges that overlap or touch the corresponding concentration ranges of claim 81. In some cases a case of *prima facie* obviousness will be established if the concentrations or concentration ranges of the prior art do not overlap or touch the claimed concentration ranges but are sufficiently close to them. See M.P.E.P. 2144.05.

With respect to the more limited embodiment of the glass of Chu, et al, disclosed in column 5 of US 6,128,430, a case of *prima facie* obviousness of the glass claimed in new claim 81 or the previously amended claims 38 and 42 cannot be based on the more limited glass composition disclosed in column 5, lines 1 to 27, of Chu, et al. This embodiment of the glass composition of Chu, et al, must contain a minimum of 8 mol % of Al<sub>2</sub>O<sub>3</sub>. The X-ray opaque glass of applicants' new claim 81 and the glass of the amended claims do **not** contain any Al<sub>2</sub>O<sub>3</sub>, i.e. 0 mol % of Al<sub>2</sub>O<sub>3</sub>, which is far from the 8 mol % of the embodiment of column 5. Also the embodiment of column 5, lines 1 to 27, of Chu, et al,

requires an effective amount of  $\text{Er}_2\text{O}_3$  for the optical amplifier application, which is also excluded by applicants' "consisting of" wording in claim 81.

Thus a case of *prima facie* obviousness of claim 81 under 35 U.S.C. 103 (a) **cannot** be based on the glass composition embodiment of column 5 of Chu, et al. The same can be said of the embodiments claimed in claim 1 of Chu, et al. for similar reasons: e.g. they require a minimum of 5 mol % of  $\text{Ga}_2\text{O}_3$ . The glass of claim 81 does not include any  $\text{Ga}_2\text{O}_3$ .

The reasons for the obviousness rejection of the claims in the Office Action appear to be based solely on the glass composition disclosed column 2, line 55, to column 3, line 22, of Chu, et al. This glass composition contains only a single required ingredient with a non-zero lower limit, namely  $\text{Er}_2\text{O}_3$ . Erbium is the ingredient that allows the glass of Chu, et al, to function as an effective optical amplifier. The reasons that the glass is limited to an erbium-containing glass composition are explained in column 1, lines 24 to 41, of Chu, et al. The remaining oxide ingredients of the glass of Chu, et al, in columns 2 and 3 are all optional ingredients with lower limits of 0. Since claim 81 only includes two required ingredients,  $\text{SiO}_2$  and  $\text{Yb}_2\text{O}_3$ , whose concentration ranges overlap those in the glass of columns 2 and 3 of Chu, et al, the only concentration range of claim 81 that does **not** overlap or touch the corresponding concentration range of Chu, et al, is the concentration range for  $\text{Er}_2\text{O}_3$ .

Thus a case of *prima facie* obviousness of claim 81 cannot be based on the fact that all the concentration ranges of all oxide ingredients of the glass of

claim 81 overlap or touch corresponding concentration ranges disclosed in column 2 and 3 of Chu, et al, because the  $\text{Er}_2\text{O}_3$  of Chu, et al, is excluded from the glass according to claim 81. On the other hand, the lower limit for the amount of  $\text{Er}_2\text{O}_3$  according to columns 2 to 3 of Chu, et al, is quite small and approaches 0.

Nevertheless it is respectfully submitted that Chu, et al, does **not** establish a case of *prima facie* obviousness of the new claim 81 under 35 U.S.C. 103 (a).

Although a prior art reference that discloses a glass composition with respective concentration ranges that encompass somewhat narrower concentration ranges of a claimed composition is often sufficient to establish a prima facie case of obviousness (see M.P.E.P. 2144.05), if the reference's disclosed concentration ranges are so broad as to encompass a very large number of possible distinct compositions, a case of *prima facie* obviousness is not established by the prior art reference. See *In re Baird*, 16 F. 3<sup>rd</sup> 380, 29 USPQ 2<sup>nd</sup> 1550 (Fed. Cir. 1994); *In re Jones*, 958 F.2d 347, 21 USPQ 2<sup>nd</sup> 1941 (Fed. Cir. 1992); MPEP § 2144.08.

The non-obviousness of claim 81 over Chu, et al, is especially clearly established since the particular exemplary embodiments of Chu, et al clearly lead one of ordinary skill in the art away from the claimed invention (see *In re Baird*, *ibid*). In the case of Chu, et al, the examples 1 to 12 in table I in columns 5 and 6 include no  $\text{Yb}_2\text{O}_3$  which is a required ingredient in the glass of applicants' new claim 81. Also examples 1 to 12 include amounts of  $\text{SiO}_2$  which are far below the lower limit for  $\text{SiO}_2$  of 75 mol % in new claim 81. In addition, examples 1 to 12 of

Chu, et al, contain between amount 0.5 to 0.05 mol % of  $\text{Er}_2\text{O}_3$ , which is excluded by claim 81 as well as amounts of other excluded ingredients, especially large amounts of  $\text{Al}_2\text{O}_3$ .

Thus Chu, et al, clearly fits the fact pattern of *In re Baird* with respect to the preferred embodiments: their preferred embodiments would lead one of ordinary skill in the art away from the glass composition according to applicants' new claim 81.

Furthermore the glass of Chu, et al, disclosed in columns 2 and 3 encompasses a much larger number of embodiments than the glass claimed in claim 81. In other words, the situation in re Chu, et al, and claim 81 totally corresponds to the fact pattern of *In re Baird*. In other words, the glass of claim 81 is related to the glass of Chu in columns 2 and 3 like a narrow species is related to a much broader generic disclosure.

The considerations of M.P.E.P. 2144.08 thus should be applied here to make an adequate determination of obviousness or non-obviousness and such considerations lead to a conclusion of non-obviousness.

First, the applicants' claimed glass compositions contain 75 to 98 mol % of  $\text{SiO}_2$ , whereas the glass compositions of Chu, et al, contain from 0 to 90 mol % of  $\text{SiO}_2$  (see column 2, line 55, to column 3, line 22, of Chu, et al). The  $\text{SiO}_2$  concentration range of the applicants is much narrower than the broad range for  $\text{SiO}_2$  of Chu, et al, which is 4 x greater. Most of the other oxide ingredients of claim 81 that are also included in the glass compositions of Chu, et al, described at column 2, line 55, to column 3, line 22, are also disclosed with significantly

broader concentration ranges in Chu, et al. For example, the maximum amount of  $\text{GeO}_2$  in the glass of claim 81 is 10 mol %, whereas in the glass of Chu, et al, the amount range for  $\text{GeO}_2$  is 0 to 90 mol %, a range that is 9 x greater! The amount ranges for  $\text{Na}_2\text{O}$  and  $\text{K}_2\text{O}$  in Chu, et al, are each 0 to 25 mol %, whereas the applicants' range is 0 to < 10 mol %. The amounts of the alkaline earth oxides in the glass of Chu, et al, can be up to 20 mol %, whereas applicants' glass only contains alkaline earth oxides in amounts up to 10 mol %. The glass of Chu, et al, can contain up to 15 % fluorine, whereas the glass of the applicants claimed in claim 81 can only contain up to 5 mol % fluorine. In the case of  $\text{Gd}_2\text{O}_3$  ( $\text{Re}_2(1)\text{O}_3$ ) the glass of Chu, et al, can contain up to 40 mol %, whereas the applicants' claimed glass composition contains a maximum of 24.9 mol %. The same is true of the concentration range for  $\text{Lu}_2\text{O}_3$ , although the concentration ranges of  $\text{ZrO}_2$ , and  $\text{TiO}_2$  in the glass of Chu are smaller than in the case of the applicants' claimed glass. On the other hand, the glass of Chu can contain many other optional ingredients, like  $\text{Bi}_2\text{O}_3$ ,  $\text{B}_2\text{O}_3$ ,  $\text{Cs}_2\text{O}$ ,  $\text{Rb}_2\text{O}$ ,  $\text{Sb}_2\text{O}_3$  and  $\text{As}_2\text{O}_3$  (in fact with comparatively large concentration ranges) besides those of claim 81).

Thus the scope of claim 81 is much narrower than the scope of the glass composition defined in columns 2 and 3 of Chu, et al, so that the principles of the *In re Baird* decision clearly apply here. The applicants' composition of claim 81 is clearly related to the disclosures in columns 2 and 3 of Chu, et al, like a narrow species is related to broad generic disclosure.

Although obviousness does not require absolute predictability, at least some degree of predictability is required. See M.P.E.P. 2143.03 and *In re*

***Rinehart***, 189 U.S.P.Q. 143(C.C.P.A. 1976). Here in the case of the instant amended claims and new claims 81 to 83 there is no reason to expect and no reason has been provided in the Office Action that one skilled in the art would modify the broadly disclose glass composition of columns 2 and 3 of Chu, et al, disclosures to arrive at the narrower species of claim 81.

In fact, the glass composition of columns 2 and 3 of Chu, et al, is designed for an optical amplifier or waveguide. There is no guidance in Chu, et al, regarding the design of X-ray opaque glass, e.g. for a dental application, and thus no reasons provided by Chu, et al, for modifying the broadly disclosed glass composition of Chu, et al, to arrive at the narrower species of claim 81. In fact, the preferred embodiments of Chu, et al, disclosed in columns 5 and 6, which do not include any of the required  $\text{Yb}_2\text{O}_3$  would lead one skilled in the art away from the claimed invention.

The last paragraph on page 4 of the Office Action suggests that the  $\text{Yb}_2\text{O}_3$  and the  $\text{Er}_2\text{O}_3$  would be interchangeable because they are both rare earth oxides. Presumably this reason for the obviousness rejection implies that it would be obvious to one skilled in the art to replace the required  $\text{Er}_2\text{O}_3$  with  $\text{Yb}_2\text{O}_3$  to obtain non-zero amounts of  $\text{Er}_2\text{O}_3$ .

However it is respectfully submitted that rare earth oxides are not interchangeable with each other in general, because they have quite different spectroscopic properties and X-ray spectra. Particularly one skilled in the prior art would not replace the  $\text{Er}_2\text{O}_3$  with  $\text{Yb}_2\text{O}_3$  in the optical amplified glass or waveguide glass of columns 2 and 3 of Chu, et al.  $\text{Er}_2\text{O}_3$  has different properties



as a dopant for amplifier glass or for the core glass of an optical fiber and is employed in different applications than  $\text{Yb}_2\text{O}_3$ . Chu, et al, requires  $\text{Er}_2\text{O}_3$  because it is essential for their application while  $\text{Yb}_2\text{O}_3$  is not.

Chu, et al, use  $\text{Er}_2\text{O}_3$  in their optical amplifiers because  $\text{Er}(+3)$  ions have a red color, which is essential for the optical amplifier application since  $\text{Er}(+3)$  ions have the required absorption band that is necessary for that application (see column 1, lines 27 to 41, of Chu, et al, for an explanation of the essential nature of  $\text{Er}_2\text{O}_3$  in their glass compositions).

In contrast, the X-ray glass of the present invention is designed for dental applications, which require high transmission of radiation in the visible spectrum, but absorption of X-ray radiation. The  $\text{Yb}(+3)$  ions as in  $\text{Yb}_2\text{O}_3$  are colorless in visible light, but  $\text{Yb}(+2)$  ions are green. Thus  $\text{Yb}(+3)$  ions have a completely different spectrum than  $\text{Er}(+3)$  ions and would be completely unsuitable as a replacement for  $\text{Er}(+3)$ .

Furthermore no one skilled in the art would use  $\text{Er}_2\text{O}_3$  in place of  $\text{Yb}_2\text{O}_3$  in the applicants' dental application because it is colored and does not absorb X-ray radiation as efficiently as  $\text{Yb}_2\text{O}_3$ .

$\text{Yb}_2\text{O}_3$  has special advantages as an X-ray absorber because it has a high X-ray opacity without excessive increases in refractive index, which are undesirable in applicants' various applications (page 19, lines 31 to last line, of applicants' specification).

Thus the  $\text{Er}_2\text{O}_3$  is **not** interchangeable with the  $\text{Yb}_2\text{O}_3$  in the glass of Chu, et al. It would not be obvious to one of ordinary skill in the art to make this sort of

substitution. The  $\text{Er}_2\text{O}_3$  is an absolute essential the optical amplifier glass of Chu, et al, or it will not perform its intended function. It is well established that a proposed modification of a prior art invention that renders the prior art invention unable to perform its intended function is not permitted under 35 U.S.C. 103 (a). See M.P.E.P. 2143.01 V.

Even under the stricter practice under **KSR** with a higher standard for patentability, a sufficient reason must be provided to explain why the prior art would be modified by one skilled in the art to obtain the claimed invention. Page 4 of the Office Action does not appear to provide a sufficient reason for the necessary modifications of the prior art in view of the foregoing arguments regarding replacement of  $\text{Er}_2\text{O}_3$  by  $\text{Yb}_2\text{O}_3$ .

In other words, no reason has been given in the Office Action for modifying the disclosed broad generic glass composition of Chu, et al, in columns 2 and 3 to obtain the more narrow species of amended claim 81. More specifically, no reason has been provided that explains why one skilled in the art would limit the  $\text{SiO}_2$  content of Chu, et al, to the large amounts over 75 mol %, would **require**  $\text{Yb}_2\text{O}_3$  in all embodiments, and would exclude the required  $\text{Er}_2\text{O}_3$  of Chu, et al, which would make it impossible for the glass of Chu, et al, to perform its intended function.

The features of claims 49 and 50 are features of preferred embodiments that are not currently relied on to establish patentability.

Combination of the disclosures of Kunert, et al, with Chu, et al, does not arrive at the invention claimed in claim 81. The dental glass of Kunert, et al,

contains 20 to 45 wt. % of  $\text{SiO}_2$  and  $\text{Yb}_2\text{O}_3$  is only an optional ingredient that can only be present in amounts up to 10 wt. %. This amount of  $\text{SiO}_2$ , when converted to mol %, is well below the applicants' lower limit of 75 mol %, so that the  $\text{SiO}_2$  concentration ranges do not overlap. Thus Kunert, et al, would lead one skilled in the art away from a glass than contains 75 mol % or more of  $\text{SiO}_2$ . Also the glass of Kunert, et al, includes a minimum of 5 wt. % of  $\text{Al}_2\text{O}_3$ , which is excluded from the glass of claim 81.

Furthermore there is no reason for one skilled in the art of making optical amplifier glass to consult a prior art reference that teaches a composition of a glass that is used for a dental application for improvements in the optical amplifier glass.

For the foregoing reasons withdrawal of the rejection of amended claims 38 and 40 to 47 as obvious under 35 U.S.C. 103 (a) over Chu, et al, is respectfully requested.

Also withdrawal of the rejection of claims 49 and 50 as obvious under 35 U.S.C. 103 (a) over Chu, et al, in view of Kunert, et al, is respectfully requested.

Furthermore it is respectfully submitted that new claims 81 to 83 should not be rejected as obvious under 35 U.S.C. 103 (a) over Chu, et al or over Chu, et al, in view of Kunert, et al.

Should the Examiner require or consider it advisable that the specification, claims and/or drawing be further amended or corrected in formal respects to put this case in condition for final allowance, then it is requested that such amendments or corrections be carried out by Examiner's Amendment and the case passed to issue. Alternatively, should the Examiner feel that a personal discussion might be helpful in advancing the case to allowance, he or she is invited to telephone the undersigned at 1-631-549-4700.

Respectfully submitted,



Michael J. Striker,

Attorney for the Applicants

Reg. No. 27,233